

1 CLAIMS

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3 We claim:

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- 5 1. A monolithic optical coupling module comprising:
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- 6 a light beam input portion;
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- 7 a light beam output portion; and
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- 8 at least one integrally formed light beam attenuator located in an optical
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- 9 path between the light beam input portion and the light beam output portion.
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- 11 2. A monolithic optical coupling module according to Claim 1, wherein the light
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- 12 beam output portion comprises an outlet adapted to couple to at least one optical
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- 13 fiber.
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- 15 3. A monolithic optical coupling module according to Claim 1, wherein the light
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- 16 beam input portion comprises an inlet adapted to couple to at least one optical fiber.
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- 18 4. A monolithic optical coupling module according to Claim 1, wherein the at least
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- 19 one integrally formed light beam attenuator comprises at least one light reflective
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- 20 portion that is disposed in the optical path to reflect at least some incident light away
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- 21 therefrom.
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- 23 5. A monolithic optical coupling module according to Claim 1, wherein the at least
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- 24 one integrally formed light beam attenuator comprises a laser ablated portion.
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- 26 6. A monolithic optical coupling module according to Claim 1, wherein the at least
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- 27 one integrally formed light beam attenuator comprises a roughened surface portion
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- 28 that has a predetermined degree of roughness;

1 wherein during use, the roughened surface portion partially scatters
2 incident light away therefrom to attenuate the incident light by a degree of
3 attenuation corresponding to the predetermined degree of roughness.

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6 7. A monolithic optical coupling module according to Claim 6, wherein the
7 roughened surface portion comprises a surface having molded surface irregularities;
8 wherein during use, the molded surface irregularities partially scatter
9 incident light away therefrom.

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11 8. A monolithic optical coupling module according to Claim 6, further comprising
12 another surface portion opposite the roughened surface portion, the roughened
13 surface portion and the another surface portion being arranged to define a gap in the
14 monolithic optical coupling module.

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16 9. A monolithic optical coupling module according to Claim 6, wherein the
17 roughened surface portion comprises one of a sand-blasted, an electro-discharge
18 machined, a turned, a face-milled, a charged particle-etched and a ground surface
19 portion.

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21 10. A monolithic optical coupling module according to Claim 6, wherein the
22 roughened surface portion comprises a plurality of light reflective portions.

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24 11. A monolithic optical coupling module according to Claim 10, wherein the
25 plurality of light reflective portions are disposed to form a pattern.

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27 12. A monolithic optical coupling module comprising:
28 a first surface portion and a second surface portion opposite the first
29 surface portion, wherein the first surface portion and the second surface
30 portion define a gap in the monolithic optical coupling module; and

1 wherein at least one of the first surface portion and the second surface
2 portion comprises an integrally-formed light beam attenuator that attenuates a light
3 beam propagating therethrough to provide an attenuated light beam.

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5 13. A monolithic optical coupling module according to Claim 12, wherein the at
6 least one of the first surface portion and the second surface portion is roughened to a
7 degree of roughness to define the integrally-formed light beam attenuator, the light
8 beam attenuator being able to attenuate the light beam by a level of attenuation
9 corresponding to the degree of roughness.

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11 14. A monolithic optical coupling module according to Claim 12, further comprising
12 a total internal reflection optical turn interface portion that turns a light
13 beam incident on the optical turn interface portion towards the gap;
14 a third surface portion through which the attenuated light beam exits the
15 monolithic optical coupling module; and
16 a fourth surface portion through which the light beam enters the
17 monolithic optical coupling module;
18 wherein at least one of the optical turn interface portion, the third
19 surface portion and the fourth surface portion comprises another integrally-
20 formed light beam attenuator.

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22 15. A method for forming a monolithic optical coupling module, wherein the
23 monolithic optical coupling module has a light beam input portion and a light beam
24 output portion, the method comprising:
25 integrally forming a light beam attenuator in a light path between the
26 light beam input portion and the light beam output portion.

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28 16. A method according to Claim 15, wherein integrally forming the light beam
29 attenuator comprises:

1 providing an input light beam of known intensity to the light beam input
2 portion, the input light beam propagating through the monolithic optical
3 coupling module to exit the module via the light beam output portion as an
4 output light beam;

5 measuring the intensity of the output light beam to determine an
6 attenuation of the input light beam; and

7 integrally forming at least one light reflective portion to further attenuate
8 the input light beam to thereby attain a predetermined attenuation relative to
9 the intensity of the input light beam.

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11 17. A method according to Claim 15, wherein the monolithic optical coupling
12 module is mounted adjacent a light source of an optical coupling assembly, and
13 wherein integrally forming the light beam attenuator comprises:

14 providing an input light beam from the light source to the light beam
15 input portion, the input light beam propagating through the monolithic optical
16 coupling module to exit the module via the light beam output portion as an
17 output light beam;

18 measuring the intensity of the output light beam; and

19 integrally forming at least one light reflective portion to attenuate the
20 input light beam to have the measured intensity of the output light beam at a
21 predetermined level.

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23 18. A method according to Claim 15, wherein integrally forming the light beam
24 attenuator comprises laser ablating an internal portion of the monolithic optical
25 coupling module.

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27 19. A method according to Claim 15, wherein integrally forming the light beam
28 attenuator comprises roughening a surface of the monolithic optical coupling module.

1 20. A method according to Claim 19, wherein roughening a surface comprises one
2 of sand-blasting, electro-discharge machining, turning, face-milling, charged particle
3 etching and grinding the surface.

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